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Research Note

Trichinella pseudospiralis Infections in Free-living Tasmanian Birds

DAVID L. OBENDORF AND KATIE P. CLARKE

Animal Health Laboratory, Mt. Pleasant Laboratories, P.O. Box 46, Kings Meadows, Tasmania 7249, Australia

ABSTRACT: Muscle tissues from 91 birds comprising 13 species were examined for the presence of *Trichinella pseudospiralis* larvae. *Trichinella* infection was detected in 2 masked owls, *Tyto novaehollandiae,* and 1 marsh harrier, *Circus aeruginosus.* These findings confirm that carnivorous or carrion-feeding birds are naturally infected with this nematode. Intestinal infection was also achieved in a 6-day-old marsh harrier after oral dosing. The source of infections and the significance of avian hosts in the epizootiology of *T. pseudospiralis* are discussed.

KEY WORDS: *Trichinella pseudospiralis,* avian infections, Australia.

Following the detection of *Trichinella pseudospiralis* Garkavi, 1972, in Tasmania, investigations were commenced to determine which free-living vertebrate hosts are responsible for the transmission and maintenance of this parasitic infection (Obendorf et al., 1990). Studies to date have suggested that *T. pseudospiralis* in Tasmania is predominantly maintained by dasyurid marsupials, in particular Tasmanian devils, *Sarcophilus harrisii,* eastern quolls, *Dasyurus viverrinus,* and spotted-tailed quolls, *D. maculatus.*

In the northern hemisphere, there are several records of free-living carnivorous birds, particularly carrion feeders, being infected with *Trichinella* sp. presumed to be *T. pseudospiralis* (Boev et al., 1979). In the Tien Shan mountain region of U.S.S.R., *T. pseudospiralis* has also been recorded in 2 crows, *Corvus frugilegus* (Shaikenov, 1980), out of a total of 744 birds. It is also quite likely that *T. pseudospiralis* was recovered from a common buzzard, *Buteo buteo,* in Spain (Calero et al., 1978). Records of *Trichinella* sp. in North American birds include the great horned owl, *Bubo virginianus* (Zimmermann and Hubbard, 1969), the pomarine jaegar, *Stercorarius pomarinus* (Rausch et al., 1956), and Cooper's hawk, *Accipiter cooperi* (Wheeldon et al., 1983).

In this study, 13 avian species with carnivorous habits were examined for the presence of *Trichinella* infection in muscles. Samples of muscle were obtained from birds killed as a result of road accidents, malicious shooting, or poisoning and trapping. Some forest ravens were obtained by authorized trapping. In addition, a 6-day-old raptor was experimentally infected with

muscle tissue containing *T. pseudospiralis* derived from a naturally infected Tasmanian devil.

Skeletal muscle removed from the chest and legs was chopped and macerated. Ten-gram samples of these muscles were digested for 12–16 hr in a solution of 1% pepsin and 0.5% concentrated hydrochloric acid. Digest fluid was passed through a 53-μm sieve and the collected material examined by light microscopy at ×40 magnification. In 2 of the 3 birds infected with *Trichinella,* counts of larvae per gram in muscle were conducted. Muscle tissues were fixed in 10% formol-saline and processed for routine histology using hematoxylin and eosin for the staining of 5-μm-thick tissue sections. A 6-day-old marsh harrier, *Circus aeruginosus,* was fed for 3 days on minced muscle from a Tasmanian devil. The bird consumed 50 g of muscle containing 34 larvae/g. The bird died 4 days after commencing the experimental feeding; the cause of death was not attributable to *Trichinella* infection. Portions of proximal, middle, and distal small intestine were fixed in 10% formol-saline for histological processing. The mucosa of each portion of intestine was scraped off the muscle wall and subsequently digested for 2 hr in pepsin/hydrochloric acid solution. The digests were carefully examined for the presence of *Trichinella.*

A list of avian species tested for the presence of *Trichinella* larvae is presented in Table 1. Larvae were detected in 2 masked owls, *Tyto novaehollandiae,* from the Deloraine district and 1 marsh harrier, *C. aeruginosus,* from the central highlands region. One masked owl had 2,130 larvae/g, whereas the marsh harrier had 650 larvae/g. These counts are considerably higher than those reported from the 3 dasyurid species; the highest muscle larva count in a marsupial was 508 larvae/g recorded from an eastern quoll (Obendorf et al., 1990). Histologically, the larvae were found within hypertrophied muscle cells and were structurally indistinguishable from *Trichinella* larvae found in the dasyurid marsupials. In 1 owl, the nematodes were associated with some host inflammatory response and myodegeneration of parasitized muscle fibers. The larvae in all 3 birds appeared viable.

Several immature male and female *Trichinella* were recovered from the intestine of the experimentally infected marsh harrier. A total of 15 females and 6 males were collected with the majority of the nematodes (13 of 21) present in the mid-small intestine. In histological section, several *Trichinella* were seen within intra-epithelial sites along the intestinal villi.

Table 1. List of birds examined for *Trichinella pseudospiralis* larvae by muscle digestion.

Avian species	No. positive/ no. examined
Order Accipitiformes (diurnal raptors)	
Grey goshawk	
Accipiter novaehollandiae	0/7
Brown goshawk	
A. fasciatus	0/5
Collared sparrowhawk	
A. cirrhocephalus	0/5
Marsh harrier	
Circus aeruginosus	1/11
Brown falcon	
Falco berigora	0/8
Wedge-tailed eagle	
Aquila audux	0/6
Order Strigiformes (owls)	
Masked owl	
Tyto novaehollandiae	2/12
Barn owl	
T. alba	0/1
Southern boobook	
Ninox novaeseelandiae	0/3
Order Caprimulgiformes (frogmouths and nightjars)	
Tawny frogmouth	
Podargus strigoides	0/4
Order Passeriformes (perching birds)	
Black currawong	
Strepera fuliginosa	0/2
Australian magpie	
Gymnorhina tibicen	0/1
Forest raven	
Corvus tasmaniensis	0/26
Total	3/91

It has been suggested that meat-eating birds may be important in the maintenance of *T. pseudospiralis* in nature (Boev et al., 1979). This study was conducted to determine if free-living Tasmanian birds are naturally infected. The sample size was small (91) and no attempt was made to sample avian species from areas of the state where the prevalence of infection in dasyurid marsupials was especially high.

The recovery of *Trichinella* infection in the marsh harrier was not unexpected, as this raptor regularly feeds on carrion (Baker-Gabb, 1982), including road-killed Tasmanian devils (Mooney, 1991). Marsh harriers migrate across Bass Strait, arriving in Tasmania in August and departing in February (Green, 1977). This repre-

sents a potential dispersal mechanism for the parasite into southeastern Australia. The ability of *T. pseudospiralis* to be maintained in mainland Australia may, however, be affected by the absence of the large dasyurid fauna, which exists in Tasmania.

The recovery of numerous *Trichinella* larvae in the muscles of 2 free-living masked owls confirms that this bird also consumes *Trichinella*-infected meats. The masked owl in Tasmania is recognized as a distinct subspecies, *T. n. castanops,* which has been geographically isolated from mainland Australia for at least 10,000 years. Although most of the masked owl's diet consists of small- to medium-sized mammals, it also includes the dasyurid marsupials, *Dasyurus maculatus* and *D. viverrinus* (Mooney, 1990). No naturally acquired infections of *T. pseudospiralis* have been detected in native or introduced rodents (Obendorf et al., 1990), although only a small number were examined. Current evidence suggests that dasyurid marsupials are predominantly responsible for the transmission and maintenance of *T. pseudospiralis* (Obendorf et al., 1990). The most likely source of *Trichinella* infection for these 2 avian species is thought to be dasyurids.

This study confirms that birds are naturally infected with the Tasmanian *T. pseudospiralis.* Domestic chickens (*Gallus* sp.) have been experimentally infected with the Tasmanian *T. pseudospiralis* isolate (Obendorf et al., 1990) while isolates from North America and U.S.S.R. have also been successfully used to infect a very wide range of avian species (Tomasovicova, 1975; Tomasovicova and Hovorka, 1982; Bober and Dick, 1983). The presence or absence of *T. pseudospiralis* infection in individual birds appears to be related to their dietary preference and availability of *Trichinella*-infected muscle tissues for ingestion. The high muscle larval recovery in the 2 birds for which counts were conducted suggests that they are suitable hosts for *T. pseudospiralis.*

Carrion feeding of infected Tasmanian devil muscle to a 6-day-old marsh harrier resulted in a successful intestinal infection. Due to the unexpected death of this bird only 4 days after commencement of feeding, the nematodes in the bowel were immature. The viability of the *Trichinella* larvae in the muscle used for dosing was low as the muscle had been kept refrigerated for several weeks prior to dosing. This may explain the small number of intestinal nematodes recovered. The same *Trichinella*-infected muscle was also used successfully to infect domestic cats, *Felis domesticus.* These findings suggest that the Tasmanian *T. pseudospiralis* is capable of infecting a wide range of animals including placental and marsupial mammals and birds.

Several other Tasmanian birds are recorded as feeding on Tasmanian devil carcasses; these include wedge-tailed eagle, white-breasted sea-eagle (*Haliaetus leucogaster*), grey goshawk, brown goshawk, brown falcon, forest raven, grey currawong (*Strepera versicolor*), grey butcherbird (*Craticus torquatus*), and grey shrike-thrush (*Colluricincla harmonica*) (Mooney, pers. comm.). All these species are potentially capable of being infected with *T. pseudospiralis.*

It is unclear whether birds are important in the epizootiology of *T. pseudospiralis* on the island of Tasmania. The presence of infection in marsh harriers, a species that migrates to and from Tasmania, is noteworthy. Nevertheless, based on the high prevalence of infection in the dasyurid marsupials, it appears that infections are principally transmitted and maintained through these carrion-feeding and cannibalistic marsupials, with certain carnivorous birds occasionally becoming infected.

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Research Note

Prevalence of *Acetodextra amiuri* (Trematoda: Cryptogonimidae) in Channel Catfish, *Ictalurus punctatus,* from Kentucky Lake, Kentucky–Tennessee

T. J. TIMMONS, R. J. SCHULER, JR., AND L. F. DUOBINIS-GRAY
Department of Biological Sciences, Murray State University, Murray, Kentucky 42071

ABSTRACT: One hundred seventy-three channel catfish, *Ictalurus punctatus,* were collected in Kentucky Lake by monthly gill netting from April through October 1988, and examined for the presence of the digenean *Acetodextra amiuri.* Only the ovaries of mature females were infected. Mature females constituted 46.8% (81/173) of the sample and 18.5% (15/81) were infected. The highest prevalences were observed during June and July (70% and 50%, respectively).

KEY WORDS: channel catfish, *Acetodextra amiuri, Ictalurus punctatus,* prevalence, Kentucky Lake, Digenea.

The prevalence of *Acetodextra amiuri* (Stafford) in channel catfish, *Ictalurus punctatus* (Rafinesque), was studied in Kentucky Lake, an impoundment of the Tennessee River. One hundred seventy-three channel catfish (>300 mm) were collected with gill nets from April through October 1988. Based upon its large size (64,800 hectares), the lake was divided into 3 sampling areas extending from Kentucky Dam in Kentucky (Tennessee River Mile 22) south to Pickwick Dam (TRM 207) in Tennessee. Area 1 (TRM 22–66) was characterized as lacustrine; area 2 (TRM 66–116) was transitional between areas 1 and 3; area 3 (TRM 116–207) was narrow and riverine, included the Pickwick Dam tailwaters, and was nearly as long as areas 1 and 2 combined. Voucher specimens were deposited in the USNM Helminthological Collection, USDA, Beltsville, Maryland 20705, as *Acetodextra amiuri* (No. 81240).

Acetodextra amiuri was observed only in the ovaries of adult channel catfish. *Acetodextra amiuri* was not observed in air bladders of either males or females as observed by Perkins (1956). Eighty-one (46.8%) of the fish collected were mature females and 15 of these (18.5%) were infected. Females infected with *A. amiuri* had a mean total length of 498 mm (range 386–601 mm), a mean weight of 1,512 g (range 687–2,471 g), and a mean ovary weight of 79 g (range 2–206 g). Females without *A. amiuri* had a mean total length of 460 mm (range 300–611 mm), a mean weight of 1,163 g (range 341–2,821 g), and a mean ovary weight of 23 g (2–237 g). There were no significant differences between fish with and without *A. amiuri* for lengths, weights, or ovary weights ($P < 0.05$). *Acetodextra amiuri* was found in ovaries before and after spawning. Channel catfish spawn in June and July (Marzolf,